

WHAT IS CLAIMED IS:

1. A method for fabricating a membrane of a structural material for a micro-device, comprising:
 - forming a first layer of sacrificial material;
 - forming a first layer of structural material over the first layer of sacrificial material;
 - forming a second layer of sacrificial material over the first layer of structural material;
 - forming a protective layer over the second layer of sacrificial material;
 and
 - subjecting the first and second layers of sacrificial material to a release etch to remove the first and second layers of sacrificial material at approximately the same rate.
2. The method of claim 1, further comprising removing the protective layer after subjecting the first and second layers of sacrificial material to the release etch.
3. The method of claim 2, wherein removing the protective layer is accomplished mechanically.
4. The method of claim 2, wherein removing the protective layer is accomplished chemically.
5. The method of claim 1, wherein forming the first layer of structural material comprises forming a layer of polysilicon.
6. The method of claim 5, wherein forming the protective layer comprises forming a protective layer of polysilicon.
7. The method of claim 1, wherein forming the first layer of structural material comprises forming a layer of single crystal silicon.
8. The method of claim 7, wherein forming the protective layer comprises forming a protective layer of single crystal silicon.
9. The method of claim 1, wherein forming the first and second layers of sacrificial material comprises forming first and second layers of oxide.
10. The method of claim 1, wherein forming the protective layer comprises:
 - forming a plurality of support legs outside a periphery of the first layer of structural material; and

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forming a protective layer over the second layer of sacrificial material and attached to the support legs.

11. The method of claim 1, wherein forming the protective layer comprises:

forming a plurality of polysilicon support legs outside a periphery of the first layer of structural material; and

forming a polysilicon protective layer over the second layer of sacrificial material and attached to the polysilicon support legs.

12. The method of claim 1, wherein forming the protective layer comprises:

forming a plurality of nitride support legs outside a periphery of the first layer of structural material; and

forming a polysilicon protective layer over the second layer of sacrificial material and attached to the nitride support legs.

13. The method of claim 1, further comprising:

forming a second layer of structural material over which the first layer of sacrificial material is formed;

forming at least one cut in the second layer of structural material; and

forming at least one cut in the protective layer.

14. The method of claim 13, further comprising:

forming a first layer of sacrificial/structural material over which the second layer of structural material is formed, such that an interface is created between the first layer of sacrificial material and the first layer of sacrificial/structural material at the at least one cut in the second layer of structural material; and

forming a second layer of sacrificial/structural material over the protective layer such that an interface is created between the second layer of sacrificial material and the second layer of sacrificial/structural material at the at least one cut in the protective layer.

15. The method of claim 14, wherein forming the first and second layers of sacrificial material comprises forming layers of a first sacrificial material and wherein forming the first and second layers of sacrificial/structural material comprises forming layers of a second material that is more resistant to removal than the first sacrificial material.

16. A membrane for a micro-device, comprising:

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a layer of material having an upper portion and a lower portion, the upper and lower portions having first and second strength gradients, respectively; wherein the first and second strength gradients are approximately the same.

17. The membrane of claim 16, wherein the layer of material is polysilicon.

18. A method for fabricating a membrane of a structural material for a micro-device, comprising:

- forming a first layer of a first material;
- forming a first layer of structural material over the first layer of the first material;
- forming at least one cut in the first layer of structural material;
- forming a first layer of a sacrificial material, less resistant to removal than the first material, over the first layer of structural material such that an interface is created between the first material and the sacrificial material at the at least one cut in the first layer of structural material; and
- subjecting the first layer of sacrificial material to a release etch to remove the first layer of the sacrificial material.

19. The method of claim 18, wherein forming the first layer of structural material comprises forming a layer of polysilicon.

20. The method of claim 18, wherein forming the first layer of structural material comprises forming a layer of single crystal silicon.

21. The method of claim 18, wherein forming the at least one cut in the first layer of structural material comprises forming at least one channel.

22. The method of claim 18, wherein:

- forming the first layer of the first material comprises forming a first layer of nitride; and
- forming the first layer of the sacrificial material comprises forming a first layer of oxide.

23. The method of claim 18, further comprising forming a second layer of structural material over the first layer of the sacrificial material.

24. The method of claim 23, further comprising:

- forming a second layer of a sacrificial material over the second layer of structural material;

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forming a protective layer over the second layer of the sacrificial material;

forming at least one cut in the protective layer;

forming a second layer of a second material over the protective layer such that an interface is created between the second layer of the second material and the second layer of the sacrificial material at the at least one cut in the protective layer; and

subjecting the second layer of the sacrificial material to the release etch to remove the second layer of the sacrificial material.

25. The method of claim 23, further comprising removing the protective layer after subjecting the first and second layers of sacrificial materials to the release etch.

26. The method of claim 25, wherein removing the protective layer is accomplished mechanically.

27. The method of claim 25, wherein removing the protective layer is accomplished chemically.

28. The method of claim 24, wherein forming the first layer of structural material comprises forming a layer of polysilicon.

29. The method of claim 24, wherein forming the protective layer comprises forming a protective layer of polysilicon.

30. The method of claim 24, wherein forming the first layer of structural material comprises forming a layer of single crystal silicon.

31. The method of claim 24, wherein forming the protective layer comprises forming a protective layer of single crystal silicon.

32. The method of claim 24, wherein:
 forming the first layer of the first material comprises forming a first layer of nitride;
 forming the first layer of the sacrificial material comprises forming a first layer of oxide;
 forming the second layer of the second material comprises forming a second layer of nitride; and
 forming the second layer of the sacrificial material comprises forming a second layer of oxide.

33. A micro-device, comprising:

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a first micromachined layer forming a membrane;
a second micromachined layer directly adjacent the first
micromachined layer, the second micromachined layer having at least one cut therein.

34. The micro-device of claim 33, wherein the at least one cut comprises at least one channel.

35. The micro-device of claim 33, wherein the first micromachined layer comprises polysilicon.

36. The micro-device of claim 33, wherein the first micromachined layer comprises single crystal silicon.

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